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AN ANGUID LIZARD FROM THE LEEWARD ISLANDS

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Through the good offices of Mr. L. Kasasian of the University of the West Indies, I received from Mr. J. Phillips, Director of Agriculture in Montserrat, a lizard which I was amazed to see was an anguid of the genus *Diploglossus;* the family had not previously been known, living or fossil, from the Lesser Antilles. Scarcely less amazing was the observation that this lizard resembles the Central American *D. monotropis* in respect of several major differentiating characters, and differs conspicuously from the known Greater Antillean species.

The specimen was collected in Montserrat by Mr. J. Kingsley Howes who tells me that he has only once before seen this lizard, and that twenty-five years ago. On the grounds that I am therefore unlikely soon to see another I describe for the second time (Underwood, 1959a) a new species of *Diploglossus* on the basis of a single specimen. Once again my description contains tedious detail, some of which may be eliminated when more specimens are examined. As explained in the earlier paper, I do not recognize the genus *Celestus* as distinct from *Diploglossus.* In the condition of the claws, prefontals, nasals, and numerous scale organs on the back, this species resembles only *D. monotropis.* I therefore borrowed two specimens of *monotropis* and prepared the description with these before me; the specimens are MCZ 37139 Yavisa, Panama, and MCZ 15353 Limon, Costa Rica.

The name of the island of Montserrat is Spanish, from the Latin *mons serratus.* As this is quite the most remarkable reptile yet reported from Montserrat, and as no other reptile bears the name of this island, I call it *Diploglossus montisserrati.*

Family ANGUIDAE Cope

Diploglossus montisserrati new species

Type and only known specimen: adult ♂ MCZ 76924, and from this specimen: left ramus of lower jaw; slide 1, prefontals, frontal (damaged), frontoparietals, interparietal (damaged), parietals and occipital scales; slide 2, series of 10 scales back from occipital; slides 3a, b and c, 12 longitudinal rows of 10 dorsal scales; slide 4, transverse row of scales from middorsal to midflank; slide 5, three rows of 10 scales forward from groin; slide 6, transverse row of tail scales at level of ankle from middorsal to midventral; slide 7, series of 20 scales back from mental; slide 8, 25 midbelly scales. Collected by J. Kingsley Howes at Woodlands Spring, elevation about 600 feet, Montserrat, West Indies, 16° 45½′ N, 62° 13′ W.

Diagnosis: A large strong-limbed *Diploglossus* with sheathed claws; three prefrontal scales; contact between nasal and rostral scales; numerous scale organs on dorsal scales but none on belly scales; very numerous scale organs on dorsal tail scales; more than 80 scales from occipital to base of tail; back plain brown, no crossbands.

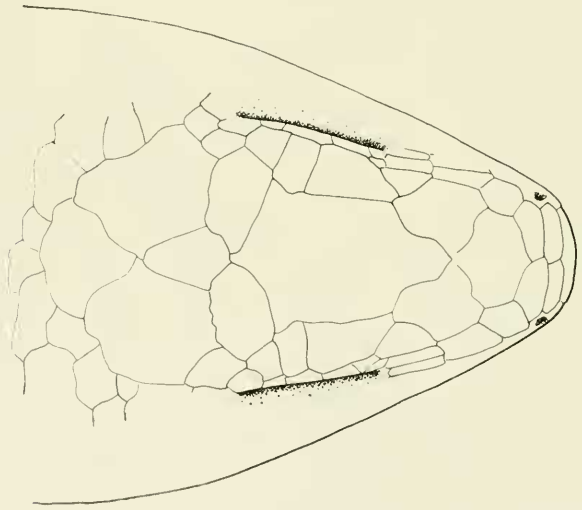

Fig. 1. Dorsal view, head of *Diploglossus montisserrati* type. Area of posterior frontal and frontoparietals may be a little inaccurate owing to damage.

Description: As this species rather closely resembles *monotropis,* I note in square brackets the features in which *monotropis* differs. Upon receipt of the first draft of my manuscript Mr. Benjamin Shreve kindly examined an additional seven specimens of *monotropis* in the Museum of Comparative Zoology for the characters which I had thought useful. His data are incorporated here. Shreve's counts on the type of *montisserrati,* when they differ from mine, are cited in parentheses.

Head broad; width: length to anterior margin of earhole = 0.83:1. Rostral one and a half times as broad as high, in contact with 1st labials, nasals, and supranasals. Pair of supranasals each meeting other supranasal, rostral, nasal, upper postnasal and frontonasal. Pair of frontonasals, each meeting other frontonasal, supranasal, upper postnasal, canthal and median prefrontal. Pair of canthals each meeting frontonasal, 2 prefrontals, 1st and 2nd loreal and upper postnasal [the same or meeting both postnasals and only 1st loreal]. Three prefrontals (sutures separating them incomplete posteriorly). Median prefrontal meets frontonasals, canthals and lateral prefrontals [and sometimes frontal]; each lateral prefrontal meets median prefrontal, canthal, 2nd loreal [1st or 2nd loreal], 1st and 2nd supraoculars [1st and 2nd or 1st only] and frontal.

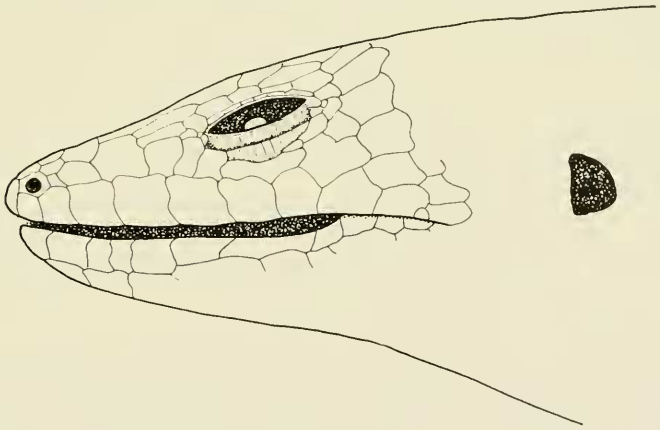

Fig. 2. Lateral view, head of *Diploglossus montisserrati* type.

Frontal tapers to a point anteriorly, wide posteriorly; meets prefrontals, 2nd and 3rd supraoculars, frontoparietals and interparietal; broadly in contact with frontoparietals, narrowly in

contact with interparietal [narrowly or broadly in contact with interparietal], excluded from contact with parietals. Palpebral aperture large. Four supraoculars, 2nd largest; 2nd loreal just meets first supraocular [no loreal meets supraoculars], 3rd loreal separated from supraoculars by 1st supraciliary [2nd or 3rd loreal so separated]. One subocular intruding only slightly between 6th and 7th labials. Six supraciliaries [6 or 7 supraciliaries], postoculars 4, 6 [4 or 5]. Five temporals between frontoparietal and labials, anterior lower temporal meets 7th and 8th labials. Single nasal meets rostral, supranasal, 1st and 2nd labials, and 2 postnasals. Three loreals [two or three loreals]: 1st small between 2 postnasals, 3rd labial, 2nd loreal and canthal; 2nd loreal large, between 1st loreal, 3rd and 4th labials, 3rd loreal, 1st supraciliary, 1st supraocular and prefrontal. [1st loreal between lower postnasal, 3rd and 4th labials, 2nd loreal, supraciliary, prefrontal and canthal]; 3rd loreal between 2nd loreal, 4th and 5th labials, preocular and 1st supraciliary [2nd loreal has the same contacts]. Small mental two-thirds width of rostral; 8, 7 [6 or 8] infralabials, prominent postmental in contact with labials, 1st and 2nd followed by 4 pairs of chin shields, 1st pair meeting in midline. Transparent area in lower eyelid covered by about 4 vertical scales.

Middorsal scales from posterior part of neck to root of tail with prominent median keel. Keels reduced on tail at about level of hindfeet [keels on tail a little more pronounced]. From occiput to end of tail, dorsal scales have longitudinal striae. Keels and striae fade on lower flank. Scales on underside of body quite smooth. Scales on forelimb and hindlimb with striae and slight keels on dorsal surface only [no keels on scales of limbs]. Soles of feet with swollen soft scales. Vertical ridge-like scale in groove between 3rd and 4th toes and soft fold of skin on proximal posterior face of 3rd toe [this condition of the 3rd and 4th toes is not developed]. Dorsal scales of fingers smooth, dorsal scales of toes striated [no striation on scales of toes].

Forty-one (43) scale rows at midbody [36-40, also confirmed by Boulenger (1885) and Taylor (1956)]; mental to vent 88 scales [85, 90]; occipital to point above vent 91 scales (occiput to base of tail 86) [72-79]; from anal to chest on line joining axillae 55 scales [53, 55]; at level of ankles 20 scale rows around tail [23, 21].

Third digit of forelimb slightly longer than 4th; lamellae 3rd digit: 8, 8 [7 or 8]; lamellae 4th digit 7, 8 [7 or 8]. Length of 4th digit of hindlimb to length of 3rd as 1.2:1; 4th toe lamellae 11, 11.

As indicated, slides were made of scales from various parts of the body; of the *monotropis* only MCZ 37139 had sufficient scales for a parallel set of preparations.

There are numerous scale organs on the prefrontal, frontal, frontoparietal, parietal and occipital scales; there are none on the interparietal [many].

Ten rows of ten dorsal scales (less three missing) had an average of 4.94 [4.71] scale organs per scale. The totals of scale organs for ten longitudinal rows of ten showed a variance of 16.7 per cent; the totals for ten transverse rows of ten showed a variance of 10.6 per cent. This suggests that a transverse or oblique row gives a more reliable count than a longitudinal row. Six of the scales lacked central keels; for the others the central keel divided the scale organs into two groups, mesial and lateral [central keel does not separate two groups]. Counting the scale rows from the vertebral line, the majority of scale organs lie on the lateral side of rows 1 and 2, the mesial side of rows 3 and 4, and all on the mesial side of rows 5 and 6.

Descending the flank the scale organs become reduced in number; on the belly there are none [on belly 2.08 organs/scale].

Three rows of ten scales forwards from the groin had a mean of 3.43 organs/scale [4.8]. On the dorsal tail scales there are very many scale organs, 42 – 73/scale [9 – 11/scale], falling to none on the underside [3 – 4/scale].

Fig. 3. Mesial view, left ramus of lower jaw of *Diploglossus montisserrati* type.

Left dentary bears 20 teeth. Teeth cylindrical; crowns of anterior teeth laterally compressed, crowns of posterior teeth rounded; many of the teeth show signs of wear on the lingual side of the crown. The outer face of the dentary has six foramina. I am indebted to Dr. Robert Hoffstetter for drawing my attention to the existence of a foramen on the inner face of the surangular before the posterior branch of the coronoid in the Cordylidae and some Anguidae. This specimen has two foramina in this position.

The osteoderms show the network of canals in the basal area (buried in the dermis), as described and figured by Hoffstetter (1962) for *D. monotropis*. The distal, epidermis-covered area shows radiating canals. The scale organs lie in the portion of the skin beyond the margin of the osteoderm. It seems unlikely therefore that scrutiny of the osteoderm would give an indication of their presence.

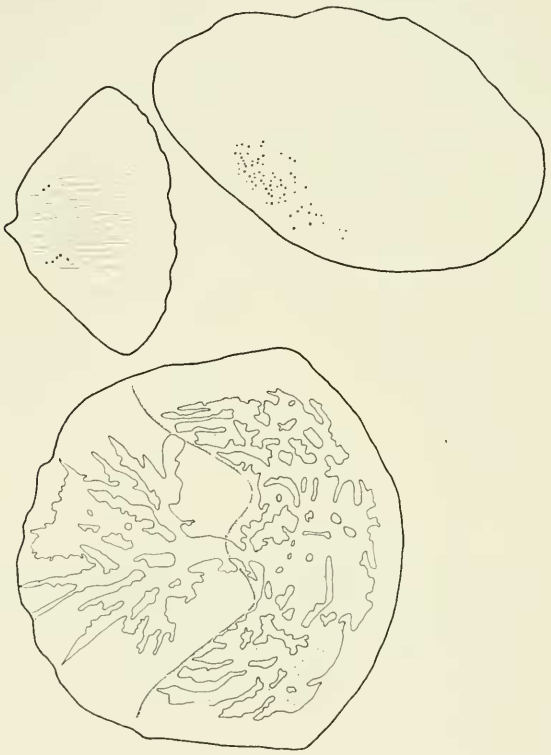

Fig. 4. Lower, middorsal osteoderm; upper left, middorsal scale; upper right, dorsal tail scale: *Diploglossus montisserrati* type.

General coloration medium brown. Top of head uniform brown, upper labials white with a few brown speckles mostly on margins, lower labials and underside of head immaculate. Starting on neck indistinct darker brown lines; across width of 12 dorsal scale rows plain brown; on flanks and onto side of tail speckles

generally covering one or two scales consisting of a dark brown mark followed by white; regenerated portion of tail darker and more uniform brown. Legs with speckles similar to those on flanks. Underside of body immaculate. *D. monotropis* has dark-edged, white crossbands which Boulenger notes may be broken into ocelli on the flanks. Dr. Ernest Williams notes a constant dark streak on the temples of *monotropis* as an additional difference from *montisserrati*.

Dimensions (contorted in preservation): snout to vent *c.* 180 mm, tail (half regenerated) *c.* 165 mm, forelimb 41 mm, hindlimb 45 mm, axilla to groin *c.* 95 mm.

DISCUSSION

We may well ask if the resemblance between *monotropis* and *montisserrati* indicates close relationship. Reference to the table (1959a, p. 13) in my previous paper shows that before the discovery of *montisserrati* the only species to combine the four characters which I hesitatingly regarded as primitive was *monotropis*. The scale organs on the belly, which I did not notice in 1959, may represent an additional primitive character. The only differences which are greater than moderate differences of degree are the color pattern, the lack of scale organs on the interparietal and on the belly, and the very numerous scale organs on the dorsal side of the tail and, perhaps, the dorsal scale count. It is therefore difficult to suppose that the two species are not related and I suggest that it is plausible to assume that, widely separated as they are geographically, they have diverged but little from a common ancestral stock. As I have previously suggested (1959a, p. 11) *monotropis* appears to be related to *fasciatus* and *resplendens* in South America, to *millepunctatus* on lonely Malpelo Island and perhaps to the limbless *Ophiodes*. I have not examined material of *bilobatus* and *lessonae* but it seems possible that these species may be related to the *monotropis* stock with the difference that they have a single prefrontal scale (Boulenger, 1855; Schmidt and Inger, 1951; Taylor, 1956). In connection with this difference it may be noted that the sutures separating the median and lateral prefrontals of *montisserrati* are incomplete. The species of northern Central America and the Greater Antilles differ more markedly from the *monotropis* group. In the Greater Antilles, Jamaica and Hispaniola have a diversity of forms while Cuba and Puerto Rico have only one species each. The Puerto Rican species has not been reported in the Virgin Islands.

It is interesting, therefore, to consider how *montisserrati* may have reached the Leeward Islands. There would seem to be two alternatives: either that *monotropis*-like *Diploglossus* was once widely spread in northern South America and from there reached Montserrat, or that *monotropis*-like stock reached the Greater Antilles from Central America and spread eastward as far as the Leeward Islands.

I regard arrival in the Leeward Islands via the Greater Antilles as unlikely. No forms are known in the Greater Antilles which resemble the *monotropis* group. We would have therefore to suppose that the *monotropis* stock passed through these islands but left no survivors, or that it underwent extensive evolutionary transformation there and gave rise to some of the now dissimilar modern forms yet survived with little change in the Leeward Islands. I have perhaps been too ready to assume in other cases, without detailed examination, that a genus which occurs in the Greater Antilles and the Leeward Islands has spread eastwards from Central America (Underwood, 1963).

I consider the proposition more plausible that the *monotropis* group was once more widely distributed in northern South America. It is a long way from the mainland to Montserrat but the journey does not seem much more improbable than the journey to Malpelo; as there are many intervening islands the journey may not in fact have been made in one stage. As the ocean drift is westwards the take-off point would perhaps be somewhere in the Guianas. That there have been changes in the fauna of the coastal belt of northern South America is very likely. *Phyllodactylus* has a distribution which is interesting in the present connection (Dixon, 1962). It occurs in Barbados, Grenada and Puerto Rico; however, the easternmost record in northern South America is Patos Island in the Gulf of Paria, between Trinidad and Venezuela. The large and conspicuous *Anolis richardii* is common in Tobago, Grenada, and the Grenadines and St. Vincent but none is known in Trinidad or on the mainland (Underwood, 1959b). Evidence of the former occurrence or present survival of the *monotropis* group in the area from the Leeward Islands to the Guianas may yet be discovered. *Diploglossus* (*lessonae*) does in fact occur in eastern Brazil (Schmidt and Inger, 1951) south of the Amazon.

What is the present status of *D. montisserrati* in Montserrat? Whatever may have been the manner of its arrival, it is now a relict, far removed geographically from relatives. I am inclined to

regard it as a survivor of the pluvial period, which has persisted in a favourable habitat in spite of the recent climatic changes. *Hyla barbudensis*, on the other hand, is an example of a species which was apparently unable to survive the drying of the climate (Auffenberg, 1958).

Although Montserrat is a small island (32½ sq. mi.), it is quite mountainous with peaks high enough (up to 3000 ft.) to precipitate rainfall, and has a good cover of moist forest and a considerable number of small rivers. Woodlands Spring is on the west side of the island and, according to the 1:50,000 survey map (Directorate of Overseas Surveys) it drains into a small stream called Runaway Ghaut.

Mr. Kingsley Howes writes, "This was the second one that I have seen, so they are very rare on the island. The first one I saw was about 25 years ago. . . . They were both seen near fresh water. The first was at sea level near the estuary of a stream, the second at Woodlands Spring, the elevation being 600′. I did not see either of them feeding, but it is possible that the second was feeding on young crayfish which were scurrying around the wet rocks where it was found." The stomach of the specimen in fact appears to be empty. The occurrence of both near fresh water would seem to fit in with the idea that it may be a relict of the pluvial period. The fact that there are many damp situations in the island means that there may be other surviving populations. Taylor describes a specimen of *monotropis* taken "in vegetation growing at the edge of Lake Bonilla . . . Costa Rica."

Most of the reptile stocks of the Leeward and Windward Islands range through several adjacent islands. The *montisserrati* stock may well have been more widely distributed in the Leeward Islands and indeed may survive on others besides Montserrat. Survival on the limestone Leeward Islands, from Anguilla to Marie Galante, is unlikely; they are low lying and dry. Some of the volcanic Leeward Islands, from Saba to Basse Terre (Guadeloupe), on the other hand, have some good wet forest on their higher slopes. Montserrat is one of the islands on which mongoose have not been introduced and this may have been a factor in its survival. Both St. Kitts, Nevis and Guadeloupe have mongoose; however, the mongoose may not extend up to the elevation at which the wet forest persists. Saba and St. Eustatius have no mongoose but they have very limited moist forest, in fact, only inside the crater on St. Eustatius. Several collections of bones

have been made in the Leeward Islands and it would not be surprising if the remains of *Diploglossus* were found on islands on which it no longer occurs. For this reason I have figured the lower jaw and an osteoderm.

I owe the specimen on which this paper is based to the generosity of Mr. Kingsley Howes of Woodlands, Montserrat. I am indebted to Dr. Ernest Williams for the loan of the specimens of *monotropis* and for discussion of my manuscript, and to Mr. Benjamin Shreve for the report upon additional specimens of the mainland species.

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